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ABSTRACT

In a study of reading achievement in the Chicago schools, regression and factor analysis were used to discover which school measures were associated with the reading comprehension scores of students ages 7, 10, and 13. Achievement data from three successive years (1974-75, 1975-76, and 1976-77) were averaged from the results of the Iowa Tests of Basic Skills. Results indicated that when the data from all of the schools were combined several implications were apparent: attendance, amount of money spent per pupil, the smaller size of the school, and the amount of teacher education all counted toward the achievement gains of students. In the primary grades, gains in reading achievement increased as the log of the percent of poverty in the community declined and as the level of poverty decreased. The percent of whites in a school was next highest to level of poverty as a predictor of reading achievement gains. The highest predictor of achievement gains in the intermediate and upper grades was the achievement level score obtained at age ten. (MKM)

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Reading Gains and Achievement in Relation to School Characteristics

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Introduction to Regression Studies

The Board of Education carried out a study in 1977 titled "Achievement in Relation to School Characteristics." Agrawal, Smith and Wick of the Department of Research and Evaluation used regression and factor analysis to discover what school measures were associated with the reading comprehension scores of students in age-cycle 11. They showed that for the set of all schools in the Chicago public schools achievement at age 11 could be explained as a function of poverty in the community, proportion of Caucasian students in the school, proportion of highly experienced teachers, attendance rate, proportion of teachers with a master's degree or above, and size of school membership. A factor analysis identified five factors among the school characteristics data: teacher experience and education level, class size, size of school, indices of poverty, and non-English speaking.

The current study reported here in detail expanded on the information and procedures of the 1977 study. In a similar fashion, school characteristics were linked with reading comprehension scores by regression equations. This study was similar to the earlier one in that it again used the school as the level of analysis, the achievement data were the school medians as published by Citywide Testing, and the characteristics data were within-school averages and percentages. The data set for this study was called "Cycle I." However, several new aspects were added:

1. reading comprehension scores for ages 7, 10, and 13 were used as successive variables to be predicted by equations involving the school characteristics
2. achievement data from three successive years (1974-75, 75-76, and 76-77) were averaged to stabilize the reading comprehension scores

3. cohort classes (classes that are age cycle "X" one year become the "X + 1" cohort the next year) over the three successive years were used to derive gains in achievement from one year to the next
4. gains of different cohort classes were combined to derive an average gain for a particular age range (primary, intermediate, and upper) over successive years, thereby stabilizing the gain scores.
5. subsets of the set of all elementary schools were formed and equations constructed for each subset (not reported on in this paper)
6. both step-wise and standard regression programs were used to construct the equations (step-wise regression involved arbitrarily entering a variable first, while in standard regression the variable with the highest r or Beta weight entered first.)

Description of the School Population Used in the Regression Analyses

All public elementary schools in the city of Chicago were included except for these:

a. Child-Parent Centers
b. 6 schools that were closed during 1974-77 (Brainard, Doniat, DuSable, Tesla, Thomas, Schley)
c. 12 upper and middle schools where gain scores were not calculable (Arai, Beale, Cooley, Kinzie, Marshall, Manley, McKinley, Piccolo, Spry, Stockton, Tuley, Wadsworth)
d. 4 special situation schools (Black and Black Br. (this is a magnet school), Disney (a magnet school), McLaren (special education school), Ray (near the campus of the University of Chicago)
e. 2 schools with no data on characteristics for 74-75 (Barnett, 75th and South Shore)
f. In addition to the above exceptions, the data from these 26

branches was combined with that of the main school:

L. Armstrong, Perkins Br. of Beard, Poe Br. of Brenan,

Buckingham, Burns, Bryn Mawr, Carter, Earle Brs.,

Edison, Ellington, Farnsworth, Farren, Haines, Hay,

Hayt, McCutcheon, Owen Park, Nelson Br. of Peck,

Raster, Sauganash, Talcott, Turner, Van Vlissingen,

Von Humbolt, and Woodson South.

With these exceptions and combinations noted, the remaining set was 473 schools, and was called "All Schools."

The School Characteristics in the Cycle I Data

The following variables were tested as predictors in the various regression equations:

1. POOR% -the percent of families in a school attendance area who were below the government-defined poverty level in 1977.
2. LPOOR -the log of POOR%
3. LOAD -pupils per regular teacher, 1974-75 data
4. MONEY -board staffing costs per student, 1974-75
5. WHITES -the percent Caucasian students, 1974-75
6. TRACE -the percent Caucasian teachers, 1974-75
7. ATTEND -the percent reported attendance, 1974-75
8. TONGUE -the percent of students who have English as second language, 1974-75
9. TYEARS -the percent of teachers with 6 or more years experience, 1974-75
10. MASTER -the percent of teachers with a master's degree or above, 1974-75

11. SPROG -the number of special programs (Title I funds), listed in School Characteristics, 1974-75
12. GENROL -the student enrollment per grade level, 1974-75
13. MEMBER -the total student membership of the school, 1974-75
14. CHANGE -the number of students gained or lost between 1974-75 and 1976-77

There were no missing data in this set of variables.

The Achievement Data in Cycle I

The reading comprehension scores from the Iowa Tests of Basic Skills (ITBS) for the years 74-75, 75-76 and 76-77 formed the basis for the dependent variables. Using Fig. 1, (See page 5) the variables were defined algebraically as follows:

SEVEN = (A+H+O)/3 TEN = (D+K+R)/3

THIRTEEN = (G+N+U)/3 PGROW = (P+Q+R-B-A-H)/5

IGROW = (R+S+T-B-C-D)/6 UGROW = (S+T+U+N-F-E-L-K)/5

INTR77 = (R+S+T)/3 INTR75 = (B+C+D)/3

SEVEN, TEN, AND THIRTEEN were the averages of the school medians over the three years for those age cycles. PGROW was the difference in scores for classes B,A, and H (See Fig. 1) and their respective cohorts in 1977, (i.e., P, Q, and R). IGROW was the difference between B,C,D and their respective cohorts in 1977 (i.e., R,S,T). UGROW was the difference between four classes; F,E,L, and K and their respective cohorts in later years (S,T,U, and N).

PGROW was, therefore, the average gain of students at the primary level. Gain scores are known to be less reliable than the scores from which they are

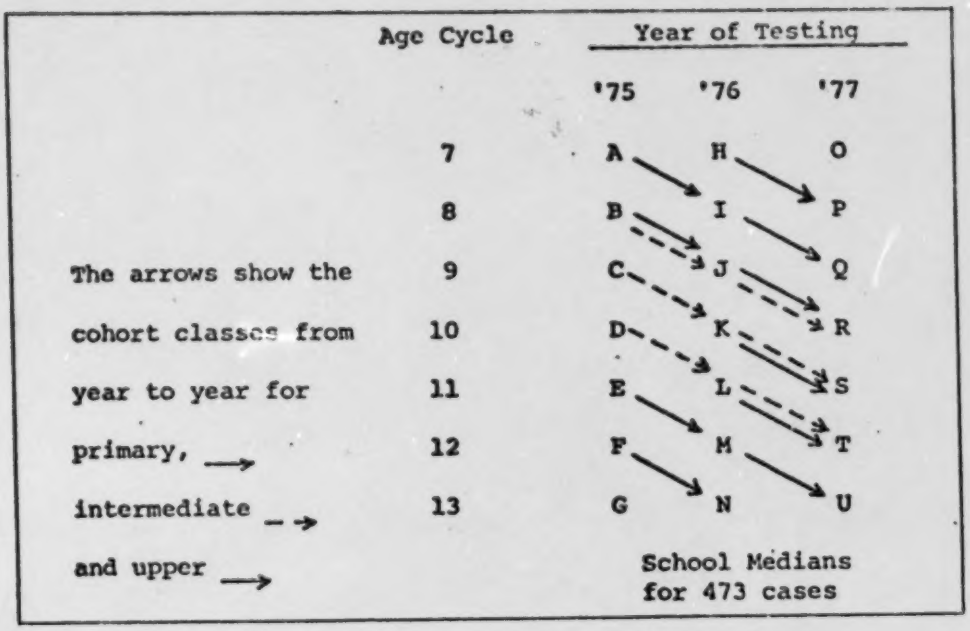

Fig 1. The array of ITBS achievement data for Cycle I.

derived. However, the procedure used here provided safeguards. The scores on which the gains were based were whole-school medians for successive years of a cohort group. Then the gains were averaged over five such cohort classes. The stability of medians for an entire age cycle in a school and the averaging of several gains to arrive at a single gain score at the primary level assured stable and reliable gain scores. Similar calculations established the IGROW and UGROW, also, as reliable indicators.

There were some missing entries in these variables. Not all the schools had age-cycle 7 students nor did they all have age-cycle 10 and 13 students. In some cases, the cohort class did not have enough students for the median to be a stable indicator of central tendency. Of the 473 schools in the set of all schools, 28 did not have enough scores to compute PGROW, 29 did not have scores to compute SEVEN, 30 did not have one of PGROW or seven. Thus the regression analysis of PGROW used 443 schools. Similarly 32 schools did not have scores for INTR75, 44 were missing for INTR77, and 49 did not have

one of INTR75 or INTR77, leaving 424 cases for the analysis of this variable. Many schools had no scores for TEN, or UGROW so that UGROW and TEN in tandem were missing 108 cases. Where there were such missing data instances, the entire file for that school was dropped from consideration in that particular regression equation.

The Step-Wise Regression Procedure

In the step-wise regression analyses, the predictor variables were grouped into sets of four. The groupings were based on anticipated low intercorrelations among the predictors within each set. Low intercorrelations among the predictor set make possible the clearest test of entry into the regression equation.

Equations for each dependent variable (PGROW, UGROW, TEN, THIRTEEN, INTR77) were constructed on successive passes through the data. For each dependent variable, another variable from the achievement data set was allowed to enter the equation first as a way of accounting for entry-level behavior. For example, when PGROW was the dependent variable, SEVEN was put in the equation initially.

In constructing the equations, the tested variable had to meet certain criteria before being considered a significant predictor:

1. It had to correlate significantly with the variable to be predicted, $p < .10$
2. The F-test of the regression equation at that point had to be significant
3. The F-test of its Beta weight prior to entry had to be significant

At each test in 2 and 3 the .05 probability level was used as the criterion level.

Procedure for Standard Regression Analyses

All variables that had entered the regression equations for the gain scores in the step-wise procedure were tested as a set simultaneously in the standard regression runs. In some instances the step-wise procedure had already fully explained the variance possible and so the standard regression equation would have been redundant.

The criterion used to determine whether a variable had entered the standard regression equation as a predictor was whether the variable explained more than 1% of the remaining variance. Notice, entry-level performance was not put in the equation first here as in step-wise regression. Entry-level was tested along with the other variables in the set.

Correlation Results for the Dependent Variable, PGROW

The correlations of each variable with PGROW are shown in Table 1. When all schools were included in the analysis of growth at the primary level, the percent poverty correlated (-.33) with this growth. As the level of poverty in the community increased, the gains made in school reading scores tended to decrease. But this correlation is small compared to the -.76 correlation between poverty and reading score at age seven (see Appendix A). Poverty has a profound effect on the absolute level of reading, but it has less importance in determining gains or changes in reading ability. Apparently factors within the schools do operate to overcome the debilitating effects of poverty to a detectable extent.

The pattern of correlations for the set of all schools showed that gains at the primary level were higher in the following types of schools: those with more white students, higher rates of attendance, more white teachers, more highly trained and experienced teachers, and fewer special programs. The change in enrollment, and percent of non-English students did not have a significant relationship. The size of school showed a mild depressing effect on gains.

Table 1: Correlations of the School Characteristics with Growth and Achievement

	Primary Gains All Schools (n=443)	Upper Gains All Schools (n=365)	Absolute Scores: Intermediate (Age 8-11) All Schools (429)	Absolute Scores: Age 10 All Schools (465)	Absolute Scores: Age 13 All Schools (358)
SEVEN	.19**			.89**	.85**
TEN		.41**			.92**
INTER75			.94**		
POOR%	-.33**	-.33**	-.80**	-.81**	-.81**
LOAD	-.04	.22**	-.01	.01	.19**
MONEY	.15**	.02	.28**	.21**	.08
GENROL	-.20**	-.37**	-.48**	-.37**	-.40**
WHITES	.33**	.30**	.78**	.80**	.79**
TYEARS	.18**	.26**	.55**	.54**	.52**
CHANGE	-.04	-.08	-.15**	-.16**	-.14**
ATTEND	.26**	.40**	.73**	.72**	.73**
MEMBER	-.14**	-.29**	-.44**	-.43**	-.41**
MASTER	.23**	.24**	.55**	.55**	.50**
SPROG	-.24**	-.28**	-.65**	-.65**	-.65**
TRACE	.25**	.18**	.55**	.57**	.58**
TONGUE	.03	-.10*	-.16**	-.14**	-.12*
LPOOR	-.37**	-.39**	-.88**	-.88**	-.85**

*Significant at the .05 level.

**Significant at the .01 level.

Regression Results for Growth at the Primary Level

The step-wise regression program was scheduled so that groups of relatively non-colinear variables would be tested on successive passes through the data. In each case a control for entry-level performance was entered as the first predictor. The control for the dependent variable PGROW was SEVEN, the reading comprehension score of pupils in age cycle 7 which was averaged over three years, 1975-77. In the first pass, POOR%, LOAD, MONEY, and GENROL were tested for their association to PGROW in all schools (see Table 2). POOR%, MONEY, and GENROL entered the equation in that order, indicating that POOR% explained a significant amount of the variation in PGROW, followed by MONEY which was a significant predictor at that point, and GENROL which also predicted or explained significant variance in PGROW. LOAD did not enter as a significant predictor. The percent of variance explained by each predictor is displayed below the variable in Table 2. The correlation is also shown below the variable name. Thus, one can see that in the set of all schools, POOR% accounted for 8.7% of the variance in PGROW when SEVEN had first entered the equation. The weight given POOR% was -.003 (see first equation in Table 2). This means that each unit increase in POOR% (from 20 to 21% for example) would be associated with a .003 year decrease in PGROW. (The equations are written in terms of years of growth. In months of growth, all the b weights would be ten times larger.) In the same way each dollar increase in MONEY will be associated with a .0004 increase in RGROW. A school in which $100 more per pupil is spent would be predicted to have .04 years more gain (or .4 more months) in reading comprehension. This does not mean that the $100 will cause the gain to occur, regression only detects that there is an association between the two variables in the existing set of data.

Table 2: Regression Equations to Test POOR%, LOAD, MONEY, and GENROL with SEVEN put in the Equation as the First Predictor of PGROW

All Schools: PGROW=(-.094)SEVEN+(-.003)POOR%+(.0004)MONEY+(-.0004)GENROL+.78				
Variance Explained:	3.5%	8.7%	3.1%	2.2%
Multiple R=.42, R^2=.175,	r=.19	r=-.33	r=.15	r=-.20

Regression Equations to Test WHITE, TYEARS, CHANGE, and ATTEND

All Schools: PGROW=(-.076)SEVEN+(.002)WHITES+(.015)ATTEND-.57			
Variance Explained:	3.5%	8.2%	2.9%
Multiple R=.38, R^2=.148,	r=.19	r=.33	r=.26

Regression Equations to Test TONGUE, MASTER, SPROG, TRACE, MEMBER

All Schools: PGROW=(-.020)SEVEN+(001)TRACE+(.0024)MASTER+(-.017)SPROG+.60				
Variance Explained:	3.5%	3.2%	2.0%	1.2%
Multiple R=.32, R^2=.100,	r=.19	r=.25	r=.23	r=-.24

Regression Equation to Test LPOOR

All Schools: PGROW=(-.105)SEVEN+(-.20)LPOOR+1.204		
Variance Explained:	3.5%	15.0%
Multiple R=.43, R^2=.186	r=.19	r=.37

In the set of all schools, the best predictor was the log of poverty. As the log of the percent of poverty in the community declined, the gains tended to increase. Poverty was the next best predictor. As the poverty decreased, gains increased. The percent of whites in a school was next as a predictor. The higher the percent of whites, the higher the gains. Money, attendance rate, teacher race, teacher training, enrollment per grade, and number of special programs each explained significant but minor amounts of variance in the different equations. A brief review of the

regression equations (see Table 2) will show that gains were higher in schools where attendance was higher, where more money per pupil was spent, fewer special programs were necessary, greater proportion of white teachers, more highly trained teachers, and in schools with smaller enrollments per grade. The entry level score at age seven also explained a minor but significant amount of variance. The lower the entry level, the higher the gains as shown by regression. This is a reversal of the direction of the correlation, a reversal which implies that the linear relationship between gains and entry level is superceded by other factors.

Correlation Results for the Dependent Variable, UGROW

The complete set of correlations for UGROW is presented in Table 1. For the set of all schools, reading level at age 10 is a significant predictor of growth in reading achievement ($r=.41$, $p<.01$). Note that age 10 performance predicts subsequent gains better than age 7 performance. Prior performance becomes a better predictor of future performance as age increases. Higher gains at the upper level are associated with less poverty, better attendance, smaller grade enrollments, higher proportions of white students, more experienced teachers, smaller schools, more teachers with masters degrees, more white teachers, fewer special programs, and larger classes. The last two are somewhat surprising until one realizes that special programs and smaller class size are to an extent responses to the problem of poor performance and low gains.

In comparison to the correlations shown for PGROW in Table 1, it appears that the effect of school size, class size, attendance, and teacher experience have increased somewhat but that the effect of the amount spent on staffing has lost significance.

Regression Results for Growth at the Upper Level

In the regression equations (Table 3) enrollment per grade (GENROL) had the highest predictive power following the achievement scores at age 10. GENROL accounted for more variance than poverty, an indication that as students grow older their gains in reading skill become less dependent upon poverty levels of the community and more sensitive to the particular conditions within the schools. Their previous track record in the form of achievement level at an earlier age (TEN) becomes a more potent predictor and perhaps it contains within it the previous effects of poverty.

Table 3: Step-wise Regression to Test POOR%, LOAD, MONEY, and GENROL

All Schools: UGROW=(.136)TEN+(-.0008)GENROL+(.013)LOAD+(.001)POOR%-.236				
Variance Explained:	17.0%	5.6%	1.4%	0.5%
Multiple R=.49, R^2=.245, r=.41		r=-.37	r=.22	r=-.33

Step-wise Regression to Test WHITE, TYEARS, CHANGE, and ATTEND

All Schools: UGROW=(.082)TEN+(.02)ATTEND-1.50		
Variance Explained:	17.1%	2.1%
Multiple R=.44, R^2=.191, r=.41		r=.40

Step-wise Regression to Test TONGUE, MASTER, SPROG, and TRACE

All Schools: (No new variables entered the equation.)

Step-wise Regression to Test LPCOR

All Schools: (No new variables entered the equation.)

Standard Regression Results

All the variables that had entered the equations in the step-wise regression studies were tested by standard regression also. Standard regression pits each variable against all the others in predicting the largest percent of variance. The significance level of .01 was used for these analyses. Each of the regression equations is presented in Table 4 below.

The standard regression equations for all schools across the three levels; PGROW, IGROW, UGROW, demonstrated how poverty is an early associate of reading gain but is no longer predictive at intermediate and upper levels. Poverty doesn't decline in correlation with gains, but other factors become more predictive and replace it in the equation. Only prior performance enters the equation at all three levels. Under the stringent criteria for entry into the equations, nothing other than prior performance is significant in predicting gains at the intermediate level, and only the grade enrollment is predictive at the upper cycle once prior performance has entered the equation.

Table 4: The Standard Regression Equations for PGROW

All Schools: PGROW=(-.193)LPOOR+(-.101)SEVEN+1.18		
Variance Explained:	13.7%	4.2%
Multiple R=.42, R^2=.179	r=-.37	r=.19

The Standard Regression Equations for IGROW

All Schools: IGROW=(.342)TEN-.109		
Variance Explained:	44.8%	
Multiple R=.67, R^2=.448,	r=.67	

The Standard Regression Equations for UGROW

All Schools: UGROW=(.102)TEN+(-.001)GENROL+.385		
Variance Explained:	17.1%	6.2%
Multiple R=.48, R^2=.232,	r=.41	r=-.37

All Schools Combined: Over this broad range of students, several implications are apparent. Attendance counts, money counts, size of school counts, and teacher education counts toward the gains of young students. If you would generally affect primary reading comprehension scores, spend more money on staffing, especially on teachers with masters degrees or above; work to reduce the size of the enrollments at each grade level in a building, and monitor attendance closely to keep the students in a consistent pattern of being there to learn.

At upper ages, students generally are showing gains that disregard poverty level and other community factors, but the effects of poverty are retained in the predictive power of prior performance in determining gains. Apart from prior scores, low attendance and large schools will depress their gains.

Caveat

Regression is, of course, not a procedure for identifying causal factors. But logic applied to the associations that are articulated by the regression equations can sometimes be used to make these projections of causal relationships. The policy implications drawn above are sound to the extent that such logic has been correctly applied. The implications as drawn seem to form a coherent, consistent pattern of rather obvious needs for affecting reading scores in the city's schools. Their very face validity seems to attest to the adequacy of the projections.

These measures are based upon a school-level analysis, however. Means and medians based on a school-level analysis suppress the effects that individual teachers would display. All you can see in these regressions is how potent or impotent the average teacher in a school was upon the average student. If the average teacher is pretty much the same across schools one will tend to get studies showing no effects even though individual teachers may have major impact on students.

Note also that the set of variables tested here for association to gains in achievement were limited in scope. The authors believe that several other variables should be added in future analyses:

1. Leadership characteristics of the principal
2. proportion of on-task, attentive, engaged time out of the total time in a school day
3. time spent in reading instruction
4. adequacy of student placement in testing
5. teacher attendance rate
6. a crowdedness index
7. students kept on schedule in CP/ML

Equations similar to those of the present study should also be constructed using gains in reading vocabulary as the predicted variable. Vocabulary may be more sensitive to school factors than is comprehension. Mathematics concepts and problems scores would also display different aspects of school effectiveness. Student-level analyses and classroom-level analyses would add another aspect of understanding of what factors are critical in affecting school outcomes. In future studies, other subsets of schools, such as small, large, K-6, K-8, EVGC and others, should be formed to identify associations unique to these.

Appendix A

Correlations Between the Set of Variables in Cycle 1 Data for the Set of All Schools (n between 358 and 473, value of .10 are significant at the .05 level, .14 at the .01 level).

	POOR%																		
POOR%																			
LPOOR	.87	LPOOR																	
ATTEND	-.71	-.69	ATTEND																
GENROL	.40	.49	-.42	GENROL															
MEMBER	.33	.40	-.34	.97	MEMBER														
CHANGE	.08	.13	-.15	.29	.22	CHANGE													
LOAD	-.14	-.11	.10	.13	.14	-.07	LOAD												
MONEY	-.05	-.27	.17	-.48	-.52	-.14	-.64	MONEY											
TONGUE	-.12	.05	-.28	.15	.14	.20	-.06	.02	TONGUE										
WHITES	-.78	-.83	.52	-.40	-.30	-.10	.09	.17	.09	WHITES									
TRACE	-.65	-.65	.31	-.22	-.22	.04	.08	.09	.27	.84	TRACE								
TYEARS	-.35	-.50	.43	-.40	-.42	-.21	.05	.46	.26	.43	.22	TYEARS							
MASTER	-.46	-.56	.43	-.37	-.38	-.08	.06	.38	.13	.49	.30	.56	MASTER						
SPROG	.69	.66	-.65	.37	.26	.20	-.20	-.05	.18	-.58	-.41	-.39	.41	SPROG					
SEVEN	-.76	-.82	.70	-.40	-.42	-.19	-.04	.24	-.18	.72	.52	.49	.52	-.60	SEVEN				
TEN	-.81	-.88	.72	-.37	-.43	-.16	.01	.21	-.14	.80	.57	.54	.55	-.65	.89	TEN			
THIRTEEN	-.81	-.85	.73	-.40	-.41	-.14	.18	.08	-.12	.79	.58	.52	.50	-.65	.84	.92	THIRTEEN		
INTR75	-.82	-.87	.76	-.52	-.43	-.18	-.03	.26	-.15	.78	.61	.53	.53	-.64	.88	.97	.92	INTR75	
INTR77	-.80	-.88	.73	-.48	-.44	-.15	-.01	.28	-.14	.78	.59	.55	.54	-.65	.91	.98	.93	.94	INTR77
PGROW	-.33	-.37	.24	-.19	-.14	-.02	-.11	.14	.03	.33	.25	.25	.23	-.24	.19	.44	.40	.48	.34	PGROW
IGROW	-.57	-.61	.47	-.36	-.32	-.14	.03	.23	-.08	.53	.40	.40	.37	-.45	.61	.67	.70	.60	.82	.60	IGROW
DGROW	-.33	-.39	.40	-.37	-.31	-.12	.00	.21	-.16	.27	.12	.30	.28	-.26	.39	.41	.53	.40	.55	.42	.68

Appendix B, Table 1: Step-wise Regression Equations for INTR77 (INTR75 was entered first.)

Variables Tested on this Pass: POOR%, LOAD, MONEY, and GENROL

All Schools: n=424, R=.94, R^2=.885
INTR77=(1.139)INTR75+(-.006)POOR%+(.0007)MONEY+.655
r=.94, 87.7% r=-.80, 0.4% r=.28, 0.3%

Variables Tested on this Pass: WHITES, TYEARS, CHANGE, ATTEND, and MEMBER

All Schools: n=424, R=.94, R^2=.892
INTR77=(1.02)INTR75+(.004)WHITES+(.004)TYEARS+(.033)ATTEND-1.98
r=.94, 87.7% r=.78, 0.8% r=.55, 0.4% r=.73, 0.3%

Variables Tested on this Pass: TONGUE, MASTER, SPROG, and TRACE

All Schools: n=424, R=.94, R^2=.883
INTR77=(1.20)INTR75+(-.049)SPROG+(.004)MASTER+(.0015)TRACE+.562
r=.94, 87.7% r=-.65, 0.3% r=.55, 0.1% r=.55, 0.1%

Variable Tested on this Pass: LPOOR

All Schools: n=424, R=.95, R^2=.894
INTR77=(1.02)INTR75+(-.46)LPOOR+2.00
r=.94, 87.7% r=-.88, 1.5%

Appendix B, Table 2: Step-wise Regression Equations for TEN (SEVEN was entered first.)

Variables Tested on this Pass: POOR%, LOAD, MONEY, and GENROL

All Schools: n=444, R=.92, R^2=.846
TEN=(.99)SEVEN +(-.011)POOR% +(.0013)GENROL +2.06
r=.89, 79.7% r=-.81, 4.2% r=-.37, 0.7%

Variables Tested on this Pass: WHITES, TYEARS, CHANGE, ATTEND, and MEMBER

All Schools: n=444, R=.93, R^2=.871
TEN=(.734)SEVEN +(.006)WHITES +(.053)ATTEND +(.004)TYEARS -2.78
r=.89, 79.7% r=.80, 5.2% r=.72, 1.7% r=.54, 0.5%

Appendix B, Table 2 continued

Variables Tested on this Pass: TONGUE, MASTER, SPROG, TRACE, and MEMBER

All Schools: n=444, R=.91, R^2=.833
TEN=(.99)SEVEN +(-.085)SPROG +(.004)TRACE +(.008)MASTER +1.51
r=.89, 79.7% r=-.65, 2.0% r=.57, 1.1% r=.55, 0.6%

Variables Tested on this Pass: LPOOR

All Schools: n=444, R=.93, R^2=.861
TEN=(.750)SEVEN +(-.667)LPOOR +3.36
r=.89, 79.7% r=-.88, 6.4%

Appendix B, Table 3: Step-wise Regression Equations for THIRTEEN (TEN was entered first.)

Variables Tested on this Pass: POOR%, LOAD, MONEY, and GENROL

All Schools: n=358, R=.93, R^2=.871
THIRTEEN=(1.36)TEN +(.074)LOAD +(-.0075)POOR% -1.53
r=.92, 83.9% r=.18, 2.7% r=-.81, 0.6%

Variables Tested on this Pass: WHITES, TYEARS, CHANGE, ATTEND, and MEMBER

All Schools: n=358, R=.93, R^2=.860
THIRTEEN=(1.10)TEN + (.089)ATTEND + (.006)WHITES -6.65
r=.92, 83.9% r=.73, 0.9% r=.79, 1.2%

Variables Tested on this Pass: TONGUE, MASTER, SPROG, TRACE, and MEMBER

All Schools: n=358, R=.92, R^2=.849
THIRTEEN=(1.37)TEN + (.005)TRACE + (-.082)SPROG +.236
r=.92, 83.9% r=.58, 0.6% r=-.65, 0.4%

Variables Tested on this Pass: LPOOR

All Schools: n=358, R=.92, R^2=.849
THIRTEEN=(1.23)TEN + (-.542)LPOOR +1.76
r=.92, 83.9% r=-.85, 1.1%